Recent studies have shown that the chromaffin granules of the adrenal medulla, which are concerned with the storage and release of catecholamines, are capable of polyphosphoinositide synthesis. The significance of this biosynthesis in relation to the functions of the granules is being investigated.

- Charalampous, F. C. (1971) *J. Biol. Chem.* **246**, 455
 Harwood, J. L. & Hawthorne, J. N. (1969) *J. Neurochem.* **16**, 1377
 Hawthorne, J. N. & Kai, M. (1970) in *Handbook of Neurochemistry* (Lajtha, A., ed.), vol. 3, p. 491, Plenum Press, New York
 Hendrickson, H. S. & Fullington, J. G. (1965) *Biochemistry* **4**, 1599
 Yagihara, Y., Salway, J. G. & Hawthorne, J. N. (1969) *J. Neurochem.* **16**, 1133

The Molecular Organization of Lipids in the Membrane of *Escherichia coli*

By S. J. WAKIL, M. ESFAHANI, A. R. LIMBRICK, S. KNUTTON and T. OKA (*Departments of Biochemistry and Anatomy, Duke Medical Center, Durham, N.C. 27706, and Department of Biochemistry, Baylor College of Medicine, Houston, Tex. 77025, U.S.A.*)

Available evidence shows that the fatty acid composition of membrane lipids of unsaturated fatty acid auxotrophs of *Escherichia coli* depends on the physicochemical properties of the supplemental unsaturated fatty acid (Esfahani *et al.*, 1969, 1971). X-ray-diffraction techniques (Engelman, 1970) have been used to investigate the physical state of the lipids in membranes of an *E. coli* mutant grown on various fatty acids (M. Esfahani, A. R. Limbrick, S. Knutton, T. Oka & S. J. Wakil, unpublished work). Wide-angle X-ray-diffraction measurements show that the lipids in these membranes undergo reversible thermotropic phase transitions. Below the transition temperature the X-ray-diffraction pattern features a sharp ring at 0.42 nm (4.2 Å) due to the close hexagonal packing of the apolar groups of the lipids; above the transition temperature the lipids are in a less organized liquid-crystalline state that gives rise to a diffuse band centred at a Bragg spacing of 0.46 nm (4.6 Å). Transition from the condensed to the liquid state occurs at temperature ranges of 19–29°C for membranes derived from cells grown on oleate or 12-bromostearate, 30–40°C for elaidate-enriched membranes and 36–46°C for membranes containing myristoleate or linolenate. These temperatures are below or about the temperature at which the cells were grown.

The effect of temperature on the proline-uptake and succinate dehydrogenase activities of these membranes has also been studied. Arrhenius plots for these two activities are found to be biphasic.

The temperatures at which discontinuities in the Arrhenius plots for proline uptake were observed are in decreasing order from elaidate (26°C) to oleate (19°C) to linolenate (14°C), indicating a sensitivity of the proline-transport process to the degree of unsaturation in the supplemental fatty acids. Similar sensitivities were reported by Wilson & Fox (1971) for both the glucoside- and galactoside-transport systems. The succinate dehydrogenase activity of the membranes shows discontinuities in the Arrhenius plots at 11°, 23° and 22°C for oleate-, linolenate- and elaidate-enriched membranes respectively. The response of the dehydrogenase to temperature and lipid composition is therefore different from that of proline uptake, and suggests an association with lipids structurally different from those associated with proline transport. Further, the disparities between the transition temperatures obtained from X-ray diffraction of membranes and the temperatures of discontinuities in the Arrhenius plots for proline transport and succinate dehydrogenase lead us to conclude that the distribution of lipids within the membrane is heterogeneous.

- Engelman, D. M. (1970) *J. Mol. Biol.* **47**, 115
 Esfahani, M., Barnes, E. M., Jr. & Wakil, S. J. (1969) *Proc. Nat. Acad. Sci. U.S.A.* **64**, 1057
 Esfahani, M., Itoneda, T. & Wakil, S. J. (1971) *J. Biol. Chem.* **246**, 50
 Wilson, G. & Fox, C. F. (1971) *J. Mol. Biol.* **55**, 49

Envelope of Semliki Forest Virus as a Membrane Model

By O. RENKONEN, C. G. GAHMBERG, L. KAARIAINEN and K. SIMONS (*Department of Biochemistry, Department of Virology and Department of Serology and Bacteriology, University of Helsinki, Helsinki, Finland*)

The different membranes of eucaryotic cells are difficult to isolate in a high state of purity. In addition, their structures are very complex, as evidenced by the multitude of the different constituent molecules. On the other hand, some enveloped viruses contain relatively simple membrane structures. As some of these viruses can be isolated easily in a high state of purity, their use in membrane research has drawn increasing attention (Pfefferkorn & Hunter, 1963; Strauss *et al.*, 1968; Friedman & Pastan, 1969; Klenk & Choppin, 1970; Simons & Kaariainen, 1970; Tiffany & Blough, 1970; Compans, 1971; Harrison *et al.*, 1971).

We have chosen Semliki Forest virus as a membrane model. This virus consists of a nucleocapsid surrounded by a lipoprotein membrane. Electron microscopy shows that the virus obtains its membrane when the nucleocapsid buds through the host-cell plasma membrane (Acheson & Tamm, 1967).